

**A Validation Study of ETEX Using the Next Generation ARAC Models**

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The Atmospheric Release Advisory Capability (ARAC) at Lawrence Livermore National Laboratory is in the midst of a multi-year modernization effort to upgrade into the new generation ARAC III modeling system. Among the components used or developed in the ARAC III system is a new computer platform, entirely new diagnostic wind field and atmospheric dispersion models, and a prognostic capability based on the Naval Operational Regional Atmospheric Prediction System (NORAPS). Thus far, validation studies involving only the individual models, rather than the integrated system, have been conducted as part of the development effort. This is because of the lack of comprehensive data sets that include both meteorological (gridded and observational) as well as dispersion data. The ETEX data set presents a unique opportunity whereby all the components of the ARAC III systems can be validated within a single field experiment.

Prognostic modeling of the ETEX experiment has been performed in an earlier study by Addis, et al. using the RAMS/LPDM modeling system. A combination of forecast and/or analysis from NCEP's Medium Range Forecast (MRF) model were used as boundary conditions for the regional simulation over Europe. The results show that the dispersion pattern of the plume may be influenced significantly by differences in boundary conditions employed in the simulations. They also observed that differences in the vertical velocities associated with using either forecast or analysis data led to noticeable differences in plume transport even when surface wind patterns show reasonable agreements.

The ARAC III system consists of a number of significant improvements over the current ARAC II system that can contribute to improved results for the ETEX validation study. Among the new features of the modeling system are:

(i) A continuous representation of the model terrain; (ii) Coupling with high resolution gridded data from a regional-scale prognostic model; (iii) Variable grid resolution in the vertical for improved resolution within the boundary layer; (iv) Overall improvement in numerical algorithms for better accuracy and efficiency. ETEX data will be used to validate the new ARAC system in two respects. First, the prognostic portion of the system will be validated by using the ECMWF forecast/analysis data as initial conditions and as time-dependent boundary conditions for finer resolution forecasts of the regional domain over the experimental site. Secondly, the results of these forecast will be used as input to the new diagnostic and dispersion models to simulate the field experiment. We expect that the higher temporal and spatial resolution of the forecasted data, in combination with the more detailed boundary layer information which is computed and utilized in the diagnostic/dispersion models, will contribute to improved dispersion patterns and more accurate simulations of the vertical structure of the plume.

**References**

R. P. Addis, D. P. Griggs, J. D. Fast, 1994: Prognostic Modeling of Atmospheric Pollutant Transport in Europe, Proc. Fifth Topical Meeting on Emergency Preparedness and Response, April 18-21, 1995, Savannah, GA.

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